REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 1, 2, 10-13, 15-25, 28-37 and 50-59 are presented for consideration. Claims 1, 16, 22, 28 and 30 are independent. Claims 26, 38 and 39 have been canceled without prejudice or disclaimer. Claims 13, 16, 23, 29, 30 and 32 have been amended to clarify features of the subject invention, while claim 59 has been added to recite additional features of the subject invention. Support for these changes and this claim can be found in the original application, as filed. Therefore, no new matter has been added.

Applicants note with appreciation that claims 30, 57 and 58 have been allowed over the art of record, and that claim 33 has been indicated as containing allowable subject matter and would be allowed if rewritten in independent form. Applicants earnestly believe, however, that they should be entitled to the protection afforded by independent claim 1, as presented (as well as by independent claims 16, 22 and 28, as presented). Accordingly, claim 33 has not been so rewritten at this time.

Applicants request favorable reconsideration and withdrawal of the rejections set forth in the above-noted Office Action.

Claim 13 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Specifically, the Examiner asserted that the phrase "wherein said field optical system is all constituted by lenses" is vague and indefinite in view of claim 13 depending from claim 1, in which field mirrors within the field optical system are recited. To expedite prosecution, claim 13 has been amended to more clearly recite that the field optical system comprises a lens.

Applicants submit, therefore, that this rejection has been overcome and should be withdrawn. Such favorable indication is requested.

Turning now to the art rejections, claims 1, 2, 10-13, 15, 17-26, 28, 29, 31, 32, 35, 37, 39, 50 and 53-56 have been rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,636,350 to Shafer et al. Claims 16, 34, 36, 38 , 51 and 52 have been rejected under 35 U.S.C. § 103 as being unpatentable over the Shafer et al. patent. Applicants submit that the cited art does not teach or suggest many features of the present invention, as recited in, for example, independent claims 1, 16, 22 and 28. Therefore, these rejections are respectfully traversed.

A. The Shafer et al. Patent

The Shafer et al. patent relates to a photolithographic reduction projection catadioptric objective, which includes a first optical group having an even number of at least four mirrors and having a positive overall magnifying power, and a second substantially refractive optical group more image forward than the first optical group having a number of lenses. The second optical group has a negative overall magnifying power for providing image reduction. The first optical group provides compensative aberrative correction for the second optical group. The objective forms an image with a numeral aperture of at least substantially 0.65 and, preferably, greater than 0.70, or still more preferably, greater than 0.75.

B. Independent Claim 1

In one aspect of the present invention, independent claim 1 recites a projection optical system for projecting an image of an object onto an image plane. The projection optical system

includes a first imaging optical system for forming an intermediate image of the object. The first imaging optical system includes (i) a first lens unit having a positive power, (ii) a first optical unit having a first mirror for reflecting and collecting abaxial light from the object, (iii) a second optical unit having a second mirror for reflecting light from the first mirror to the image plane side, with which the abaxial light is caused to pass an outside of an effective diameter of the first mirror, and (iv) a second lens unit having a negative power and being disposed between the first and second mirrors. The projection optical system further includes a second imaging optical system for re-imaging the image upon the image plane, and a field optical system disposed between the first imaging optical system and the second imaging optical system, for projecting a pupil of the first imaging optical system onto the second imaging optical system, the field optical system including a first field mirror unit having a first field mirror, a second field mirror unit having a second field mirror, and one positive lens disposed adjacent the image plane side of the first mirror.

Accordingly, the present invention recited in independent claim 1 includes, among other features, "one positive lens disposed adjacent the image plane side of said first mirror." Applicants question whether the Examiner incorrectly considers the feature of "said first mirror" as being "a first field mirror," as recited above in independent claim 1. Actually, however, in the present invention recited in independent claim 1, the feature of the "said first mirror" is intended to be an optical element that is included in the first optical unit of the first imaging optical system. By way of example, this element can be considered to correspond to the mirror M1 shown in Figure 3B of this application, and the recited "one positive lens" can be considered to correspond to the lens at L1, as shown in Figure 3B. Applicants submit that, as compared to the

features discussed above, Figure 2 of the Schafer et al. patent shows mirror M21, which is an element that could be considered to correspond to the recited "said first mirror." Applicants submit, however, that in the Shafer et al. patent, there is no lens element adjacent the image plane thereof. Applicants submit, therefore, that the structure of the projection optical system shown in the Shafer et al. patent is completely different from that recited in independent claim 1. Accordingly, Applicants submit that the Shafer et al. patent does not teach or suggest at least the recited feature of the "one positive lens disposed adjacent the image plane side of said first mirror," in the manner of the present invention recited in independent claim 1.

C. Independent Claim 16

In another aspect of the present invention, independent claim 16 recites a projection optical system for projecting an image of an object onto an image plane. The projection optical system includes a first imaging optical system for forming a first intermediate image of the object. The first imaging optical system includes (i) a first lens unit having a positive power, (ii) a first optical unit having a first mirror for reflecting and collecting abaxial light from the object, (iii) a second optical unit having a second mirror for reflecting light from the first mirror to the image plane side, with which the abaxial light is caused to pass an outside of an effective diameter of the first mirror, and (iv) a second lens unit having a negative power and being disposed between the first and second mirrors. The projection optical system further includes a second imaging optical system for re-imaging a second intermediate image upon the image plane, and a field optical system disposed between the first imaging optical system and the second imaging optical system, for projecting a pupil of the first imaging optical system onto the second

imaging optical system and for forming the second intermediate image of the object. The field optical system includes a first field mirror unit having a first field mirror with a concave surface, and a second field mirror unit having a second field mirror with a concave surface.

Accordingly, in the present invention recited in independent claim 16, the projection optical system is arranged to image light three times. Applicant submits, however, that, in the projection optical system shown in the Shafer et al. patent, light is imaged only twice. Thus, Applicants submit that the projection optical system shown in the Shafer et al. patent is far removed from the present invention recited in independent claim 16.

D. Independent Claim 22

In a further aspect of the present invention, independent claim 22 recites a projection optical system for projecting an image of an object onto an image plane, including a first imaging optical system for forming an intermediate image of the object. The first imaging optical system includes (i) a first lens unit having a positive power, (ii) a first optical unit having a first mirror for reflecting and collecting abaxial light from the object, (iii) a second optical unit having a second mirror for reflecting light from the first mirror to the image plane side, with which the abaxial light is caused to pass an outside of an effective diameter of the first mirror, and (iv) a second lens unit having a negative power and which is disposed between the first and second mirrors. The projection optical system further includes a second imaging optical system for re-imaging the intermediate image upon the image plane, and a field optical system disposed between the first imaging optical system and the second imaging optical system, for projecting a pupil of the first imaging optical system onto the second imaging optical system. The field

optical system includes a first field mirror unit having a first field mirror, and a second field mirror unit having a second field mirror. The first optical unit has a magnification BGM1, which satisfies a relation $-1.2<1/BGM1<-0.2$.

Accordingly, the present invention recited in independent claim 22 is directed to an arrangement of a first imaging optical system, a second imaging optical system and a field optical system disposed between the first imaging optical system and the second imaging optical system, in which a first optical unit of the first imaging optical system has a magnification BGM1, which satisfies a particular relation. As discussed in the subject specification on page 42, line 24, to page 43, line 15, this arrangement provides significant advantages with respect to ease of aberration correction.

Applicants submit that the Shafer et al. patent does not at all teach or suggest the arrangement of the first imaging optical system, second imaging optical system and field optical system of the present invention recited in independent claim 22, in which the first optical unit of the first imaging optical system has a particular magnification.

E. Independent Claim 28

In still another aspect of the present invention, independent claim 28 recites a projection optical system for projecting an image of an object onto an image plane. The projection optical system includes a first imaging optical system for forming an intermediate image of the object. The first imaging optical system includes (i) a first lens unit having a positive power, (ii) a first optical unit having a first mirror for reflecting and collecting abaxial light from the object, (iii) a second optical unit having a second mirror for reflecting light from the first mirror to the image

plane side, with which the abaxial light is caused to pass an outside of an effective diameter of the first mirror, and (iv) a second lens unit having a negative power and being disposed between the first and second mirrors. The projection optical system further includes a second imaging optical system for re-imaging the intermediate image upon the image plane, and a field optical system disposed between the first imaging optical system and the second imaging optical system, for projecting a pupil of the first imaging optical system onto the second imaging optical system. The field optical system includes a first field mirror unit having a first field mirror, and a second field mirror unit having a second field mirror, in which a relation $0.45 < LFM1/LFM2 < 0.8$ is satisfied, where LFM1 is a distance between the second field mirror and the first field mirror, and LFM2 is a distance between the second field mirror and the image plane.

Accordingly, the present invention recited in independent claim 28 provides a projection optical system which includes an arrangement of a first imaging optical system, a second imaging optical system and a field optical system disposed between the first imaging optical system and the second imaging optical system. The field optical system includes a first field mirror unit having a first field mirror and a second field mirror unit having a second field mirror. Also, a particular relation of LFM1/LFM2 is satisfied where LFM1 is the distance between the second field mirror and the first field mirror, and LFM 2 is the distance between the second field mirror and the image plane. As discussed in the subject specification on page 46, lines 8-19, this arrangement of the present invention provides a significant technical advantage of making smaller the production of any aberration.

Applicants submit that the Shafer et al. patent does not teach or suggest the arrangement of the first imaging optical system, the second imaging optical system, and the field optical

system of the present invention recited in independent claim 28, in which a particular relation of LFM1 to LFM2 is satisfied.

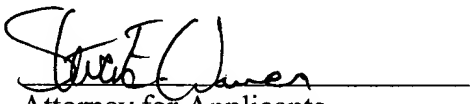
For the foregoing reasons, Applicants submit that the Shafer et al. patent does not teach or suggest many features of the present invention, as recited in independent claims 1, 16, 22 and 28. Applicants further submit that the present invention, as recited in independent claims 1, 16, 22 and 28, also is patentably defined over the cited art.

Dependent claims 2, 10-13, 15, 17-21, 23-25, 29, 31-37, 50-56 and 59 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicants further submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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